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Railroad Ties

1. All the railroad lines known to me in the Soviet Union used wooden ties. Steel was never used. Concrete ties were tried once on an experimental basis in the North Caucasus in 1919 near the station of Kushchevka on the Voroshilovka line. The experiment was not successful as the concrete cracked whenever railroad workers happened to strike it with a pick while repairing the line. The subways in Moscow, however, have concrete ties at the stations. Two types of wood were used, oak and pine. In the southern part of the USSR, oak and pine were used in approximately equal proportions, but in the north, only pine was used. The oak was the more durable of the two, but it was more expensive. Approximately 70% of the ties were creosoted. All the main lines and almost all the new lines that were being constructed were creosoted. In general, it was only the sidings and secondary lines that were not creosoted. I do not remember ever seeing ties pre-bored to reduce damage from driving spikes or pre-adzed for tie-plate, but it must be remembered that I was concerned with surveying and planning of railroad lines and not with actual construction methods.

2. Railroad ties were graded on the basis of thickness. There were three different thicknesses, 15.5 cm, 13.0 cm, and 12.0 cm; the more traffic on the line, the thicker the tie used. All the railroad lines coming under the Ministry of the Lines of Communication were gradated into four classifications as to the number of ties used per kilometer and given Roman numeral designations accordingly.

I - 1840 ties per kilometer
II - 1600 ties per kilometer

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III - 1460 ties per kilometer
IV - 1200 ties per kilometer

(I am not sure if 1460 ties per kilometer is correct for class III.) The more traffic on the line or the more strategic its significance, the more ties per kilometer were used; main lines used class I or II ties. The ties of 15.5 cm thickness were used for class I, of 13.0 cm thickness for class II, and of 12.0 cm thickness for classes III and IV. As a general rule, sidings always used one class less than the line to which it was attached. A railroad line of class I with 1840 ties per km, for example, would have sidings of class II with 1600 ties per kilometer. Other railroad lines which did not come under the Ministry of the Lines of Communication generally used ties at a ratio of 1200 ties per km or less. They were lines coming under such ministries as Heavy Industry, Mining, or Fuel, and were generally approach lines to industrial, power, or mining installations.

Rails

3. All the rails used on Soviet railroads were 12.5 meters in length. They were divided into four classes as to weight corresponding to the four classes of ties:

IA - 48 kilograms per meter
IIA - 44 kilograms per meter
IIIA - 36 kilograms per meter
IVA - ? kilograms per meter

Thus class IA rails weighing 48 kilograms per meter would be used with class I ties (1840 ties per kilometer). There was also one pre-Revolutionary type of rail of a weight of 22½ pounds per foot, which was still in existence at some stations and sidings as late as World War II. Information on the type of rail, for example, IA, was rolled into the side of the rail along with the plant where manufactured and the date. In general, the rails were of extremely poor quality and deteriorated rapidly, necessitating frequent replacement. Rails that had undergone considerable wear on main line track, instead of being shifted to secondary lines and sidings were returned to the factory to be remelted in the Bessemer process and made again into rails. The only cases known to me where rails were used again, involved deteriorated rails which were segmented and employed as short sections on the inside of curves or at switches. I know nothing of re-rolling of rails.

Fuel and Electric Power

4. An example of the ratio of passenger to freight trains on Soviet railroads would be the line between Verkhovuyevo and Dnepropetrovsk, where at the station of Yasinovata (48°08'N, 37°51'E) there was a ratio of four times as many freight trains as passenger trains. In 1940 there were approximately 100 freight trains per day along the line and approximately 25 passenger trains. This ratio naturally varies with different lines, but the freight traffic is by far predominant in the USSR.

5. Only one type of locomotive classified as to type of fuel is generally used on any segment of a line. In the Caucasus below Rostov, for example, all lines use oil burning locomotives except for a section between Baku and Tbilisi of about 250 kilometers through the Suramskiy Pass (42°01'N, 43°30'E), where electric locomotives are used because of the steepness of the grades. I should also mention a type of locomotive that is used in a few places in the Caucasus and other parts of the USSR where there is not much water available, such as near the Turkestan-Iran border. The locomotive is designated C^{O} and utilizes condensed steam in such a manner that

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it needs comparatively little water to operate. Instead of being allowed to escape through the smoke-stack of the locomotive, the steam is conducted back into the tender where it is condensed again into water and returned to the locomotive for further use. Most of the oil consuming locomotives are concentrated in the Caucasus, where there is a ready supply of oil; most of the West of the USSR uses coal burning locomotives; modern electric locomotives are in service in some places [see Enclosure (A)].

Manpower

6. The number of trainmen required to operate a typical passenger train depends on whether it is a long-haul or short-haul train. Any trip requiring more than eight hours is considered a long haul. Each long haul passenger train has a train commander, one greaser, an electrician, and two conductors in each passenger car. There are also technical inspectors and controllers who board the train at various intervals. A short-haul passenger train requires less personnel. Usually there is the train commander, the electrician, sometimes a greaser, but only one conductor for every two cars instead of two conductors for each car. Electric and oil burning locomotives have two men to operate them; an engineer and his assistant, while coal burning locomotives are manned by three men, the engineer, his assistant, and a stoker. This includes all types of coal burning locomotives, passenger locomotives, ИС, СУ, См, Ау, Б, Лв, and freight locomotive types ФД, Эм, Эр, Эу, Эх, Е, Ш, Ов, Од, Л, as well as passenger and freight locomotive Ц. Freight trains not including the locomotive have only three men to operate them, a chief conductor who is stationed in the first car, with all the train documents, a tail conductor who stays in the last car of the train, and a lubricator. This does not usually vary with the size of the train or the length of the haul.

7. There are wide variances in the number of personnel maintaining various stations and yard facilities in the USSR, ranging all the way from the several thousand personnel needed to maintain the station and yards at Yasinovataya (48°08'N, 37°51'E) to the approximately fifty-five personnel needed to maintain a typical small station like Igren' on the Stalinskaya line. At the Igren' station, there are a stationmaster, three train controllers, who operate on three eight-hour shifts, two cleaners, who work on two eight-hour shifts during the day but not at night, six switchmen who are stationed one each at a point on each side of the station and rotate on three eight-hour shifts, three ticket sellers, rotating on eight-hour shifts, and two baggage men working on two eight-hour shifts during the day, but not at night. In addition, there are approximately forty repairmen attached to the station, who keep the tracks and the yard in order.

8. When I was in the USSR, trainmen worked by law eight hours a day, six days a week. They were all paid a monthly salary and so did not receive any extra compensation for overtime. The personnel attached to stations and repair facilities were usually able to keep to their eight-hour day, except for the stationmaster who, for example at the station of Igren', had to work sometimes from sixteen to twenty hours in a day. The personnel operating trains, however, often had to work sixty hours or more per week without extra compensation, because of delays in their schedules which forced them to remain underway overnight, and to operate their scheduled train the following day.

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LIBRARY SUBJECT & AREA CODES

ENCLOSURE (A): Chart Showing Rail Types, Fuel, Ballast and Principal Ulitisation of Various Railway Lines in the USSR

755.224	N
755.223	N
755.73	N
755.75	N
755.35	N
755.61	N
762.106	N
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	Railway	Rail Type	Fuel	Ballast	Principal Utilization
Novosibirsk (55°02'N, 82°53'E) - Sokur (55°13'N, 83°12'E)	Tomskaya	II A	Coal	Rubble	Main Line
Novosibirsk - Leninsk Kuznetsk (54°38'N, 86°12'E)	Tomskaya	II A	Coal	Gravel	Coal, Ore
Altaisk (51°58'N, 85°21'E) - Artyshta (54°10'N, 86°16'E)	Tomskaya	II A	Coal	Gravel	Coal, Ore
Biysk (52°35'N, 85°14'E) - Barnaul (53°20'N, 83°48'E)	Tomskaya	IIX A	Coal	Sand	Wood and Local transport
Akhpun - Tashtagol (52°47'N, 87°57'E)	Tomskaya	II A	Coal	Gravel	Ore
Tashtagol - Shalym (52°49'N, 87°52'E)	Tomskaya	II A	Coal	Gravel	Ore
Tashtagol - Sheregesh	Tomskaya	II A	Coal	Gravel	Ore
Tomsk (56°30'N, 84°58'E) - Asino (57°00'N, 86°09'E)	Tomskaya	III A	Coal	Sand	Wood and Timber
Taiga (56°04'N, 85°24'E) - Tomsk	Tomskaya	IV A-III A	Coal	Sand	Wood and Timber
Rubtsovsk (52°31'N, 81°14'E) - Ridder (50°22'N, 83°32'E)	Tomskaya	II A	Coal	Rubble	[illegible], Coal, Ore, Zinc
[illegible] (56°07'N, [illegible]) - Kemerovo ([illegible])	Tomskaya	II A	Coal	Gravel	Coal
[illegible] - [illegible] (53°44'N, 87°10'E)	Tomskaya	III A	Coal	Sand	[illegible]
[illegible]	Tomskaya	II A	Coal	Sand, Gravel	[illegible]
[illegible] (53°20'N, [illegible])	Tomskaya	II A	Coal ?	Gravel	[illegible]
[illegible]	Tomskaya	II A - III A	Coal	Rubble	[illegible]
[illegible] ([illegible], 66°20'E)	[illegible]	II A - I A	Coal ?	Rubble	[illegible]
[illegible]	Karagand	II A - I A	Coal ?	Rubble	Ore, Coal
[illegible] - Pavlodar ([illegible], 77°00'E)	Omskaya	II A - [illegible] A	Coal ?	Rubble	Ore, Coal
[illegible] - [illegible] (52°35'N, [illegible])	Omskaya	II A	Coal ?	Gravel	Ore, Coal

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	Railway	Rail Type	Fuel	Ballast	Principal Utilization
Petropavlovsk (54°52'N, 69°06'E) - Omsk	Omskaya	II A	Coal	Rubble	Main Line
[illegible] (53°44'N, 87°10'E) - Abakan (53°4[illegible]'N, 91°30'E)	Under Construction	I A	Coal	Rubble	Ore
Achinsk (56°17'N, 90°30'E) - [illegible] (58°27'N, 92°10'E)	Planned	II A	Coal and Wood	Gravel	Wood
Achinsk - Abakan	Krasnoyarskaya	22 lb. III A	Coal	Sand	Coal, Wood, Export
Verkhneudinsk (52°00'N, 107°37'E) - Kyakhta (50°20'N, 106°30'E)		II A	Coal	Rubble	Export
Taishet (55°57'N, 98°02'E) - Kirensk (57°46'N, 106°08'E)	Under Construction	II A	Coal	Gravel	Main Line
[illegible] - [illegible] (54°52'N, 38°14'E)	Stalinskaya	II A	Electric	Shells	Ore
[illegible] (43°44'N, 43°42'E) - Gorod	Stalinskaya	IV A	Coal	Sand	Tools
[illegible] - N D - ok Usel	Stalinskaya	II A	Coal	Rubble	Main Line
N D - ok Usel - Kherson (46°40'N, 32°35'E)	Stalinskaya	II A - III A		Sand	Grain, Military
[illegible] - Pyatikhatki	Odesskaya	II A	Electric*	Rubble	Main Line
Pyatikhatki - Chaplino	Stalinskaya	II A	Electric*	Rubble	Main Line
Chaplino - Yasinovataya (48°08'N, 37°51'E)	Yuzhnaya Donetskaya	IIA	Electric*	Rubble	Main Line
Pyatikhatki - Dolgintsevo	Stalinskaya	II A - III A	Coal	Sand	Ore
Dolgintsevo - Zaporozh'ye (47°49'N, 35°11'E)	Stalinskaya	II A	Electric	Shells, Rubble	Ore, Manganese

* Planned for electrification in 1939, but unknown if implemented.

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	Railway	Rail Type	Fuel	Ballast	Principal Utilization
Zaporozh'ye - Volnovakha (47°36'N, 37°30'E)	Stalinskaya	II A	Coal	Shells	Ore, Grain
Verkhovtsevo - Dolgintsevo	Stalinskaya	III A	Coal	Shells	Ore, Grain
Dolgintsevo - Dolinskaya (48°07'N, 32°46'E)	Stalinskaya	III A - IV A	Coal	Sand	Ore
Bagley - Dneprodzerzhinsk (48°30'N, 34°37'E)	Stalinskaya	II A	Electric*	Rubble	Metal
Sukhachevka (48°28'N, 34°54'E) - Pravda	Stalinskaya	II A	Electric*	Rubble	Metal
Sukhachevka - Lotsmanskaya (48°25'N, 35°04'E)	Stalinskaya	II A	Electric*	Rubble	Main Line
Pavlograd (43°44'N, 43°42'E) - Sevastopol	Yuzhnaya Stalinskaya	III A	Coal	Shells, Sand	Military, Grain
Sarabuz - Yevpatoriya (45°12'N, 33°24'E)	Stalinskaya	IV A - 22 lb.	Coal	Sand	Local Traffic
Novo mosko[illegible] [illegible]vograd	Stalinskaya	II A	Electric*	Rubble	Ore, Main Line
[illegible]armeysk	Stalinskaya	II A		Rubble	Main Line
Krasnoarmeysk - Rutchenkovo (47°57'N, 37°44'E)	Yuzhnaya Donetskaya	III A - IV A	Coal	Sand	Coal
Ashenkoy - Armyansk	Stalinskaya	IV A	Coal	Shells	Grain, Ballast
Ashenkoy - Genichesk (46°11'N, 34°46'E)	Stalinskaya	IV A	Coal	Shells	Ballast
Armyansk - Perekop - Nikolayev	Unfinished	IA	Coal	Shells,	Military, Grain
Yasinovataya (48°08'N, 37°51'E) - Mariupol (47°05'N, 37°36'E)	Yuzhnaya Donetskaya	II A	Coal	Sand	Coal, Ore, Metal
Yasinovataya - Mushketovo (47°58'N, 37°51'E)	Yuzhnaya Donetskaya	II A	Coal	Sand	Metal

* Planned for electrification in 1939, but unknown if implemented.

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Railway	Rail Type	Fuel	Ballast	Principal Utilization
Nevinomysskaya (44°38'N, 41°57'E) - Prokhladnaya	Ordzhonikid II A	Oil	Rubble	Oil
Rostov - Nevinomysskaya	Voroshilovka II A	Oil	Rubble	Main Line, Oil
Bataysk (47°10'N, 39°44'E) - Sal'sk (46°28'N, 41°35'E)	Voroshilovka II A	Oil	Sand	Grain
Bataysk - Akkay (47°58'N, 43°59'E)	Voroshilovka III A - IV A	Oil	Sand	Circuit route to Rostov
Bataysk - Azov (47°07'N, 39°25'E)	Voroshilovka III A - IV A	Oil and Coal	Sand	Grain, Fish
Kushchevka - Staro-Minskaya (46°32'N, 39°05'E)	Voroshilovka III A	Oil	Sand	Grain
Staro-Minskaya - Yeysk (46°40'N, 38°17'E)	Voroshilovka III A - II A	Oil	Gravel	Grain
Akhtyri - Krasnodar (45°02'N, 39°00'E)	Voroshilovka III A	Oil	Gravel	Grain, Cement
Tikhoretskaya (45°52'N, 40°40'E) - Stavropol'	Voroshilovka III A	Oil	Gravel	Grain, Cement
Tikhoretskaya - Sal'sk (46°28'N, 41°35'E)	Voroshilovka III A	Oil	Sand	Grain
Kavkazskaya - Krasnodar (45°02'N, 39°00'E)	Voroshilovka IV A	Coal	Sand	Grain
Kavkazskaya 445°26'N, 40°40'E) - Stavropol'	Voroshilovka IV A - III A	Coal	Sand	Grain
Stavropol' - Blagodarnoye	Voroshilovka III A	Coal and Oil	Sand	Grain
Petrouskoye (45°22'N, 42°52'E) - Diunoye (45°56'N,43°23'E)	Voroshilovka III A	Oil	Sand	Grain
Staro - Minskaya - Akhtyri	Voroshilovka III A - II A	Oil	Gravel	Grain

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ENCLOSURE (A)
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